

CLAIMS

1. A method for forming photoresist pattern for use in manufacture of semiconductor device, including a step of forming a porous underlayer coating on a semiconductor substrate; a step of forming a photoresist layer on the porous underlayer coating; a step of exposing the semiconductor substrate covered with the porous underlayer coating and the photoresist to light; a step of developing the photoresist after the exposure to light; and a step of removing the porous underlayer coating corresponding to a part of developed and removed photoresist by etching.
2. The method for forming photoresist pattern according to claim 1, further including a step of forming an anti-reflective coating or a flattening coating before or after the step of forming a porous underlayer coating on a semiconductor substrate.
3. The method for forming photoresist pattern according to claim 1, wherein the porous underlayer coating is formed by applying an underlayer coating forming composition containing a blowing agent or a polymer having a blowing group on a semiconductor substrate, and heating it.
4. An underlayer coating forming composition for forming a porous underlayer coating for use in manufacture of semiconductor device, comprising a blowing agent, an organic material and a solvent.
5. An underlayer coating forming composition for forming a porous underlayer coating for use in manufacture of semiconductor device, comprising a polymer having a blowing group and a solvent.
6. An underlayer coating forming composition for forming a porous underlayer coating for use in manufacture of semiconductor device, comprising a polymer having a blowing group, an organic material and a solvent.
7. The underlayer coating forming composition according to claim 4, wherein the blowing agent is a blowing agent that is decomposed with heat to generate nitrogen, carbon dioxide or water vapor.

8. The underlayer coating forming composition according to claim 5 or 6, wherein the polymer having a blowing group is a polymer that is decomposed with heat to generate nitrogen, carbon dioxide or water vapor.
9. The underlayer coating forming composition according to claim 4 or 6, wherein the organic material is an organic material containing at least one component selected from the group consisting of a polymer, a crosslinking compound and a light absorbing compound.
10. The underlayer coating forming composition according to claim 9, wherein the polymer is a polymer having at least one aromatic ring structure selected from the group consisting of a benzene ring, a naphthalene ring, an anthracene ring and a triazine ring.
11. The underlayer coating forming composition according to claim 9, wherein the crosslinking compound is a compound having at least two crosslink forming substituents.
12. The underlayer coating forming composition according to claim 9, wherein the light absorbing compound is a compound having at least one ring structure selected from the group consisting of a benzene ring, a naphthalene ring, an anthracene ring and a triazine trione ring.
13. A method for forming photoresist pattern for use in manufacture of semiconductor device, including a step of forming a porous underlayer coating by applying the underlayer coating forming composition according to any one of claims 4 to 12 on a semiconductor substrate and heating it; a step of forming a photoresist layer on the porous underlayer coating; a step of exposing the semiconductor substrate covered with the porous underlayer coating and the photoresist to light; a step of developing the photoresist after the exposure to light; and a step of removing the porous underlayer coating corresponding to a part of developed and removed photoresist by etching.